The Tool Engineer

Official Publication of the

AMERICAN SOCIETY OF TOOL ENGINEERS

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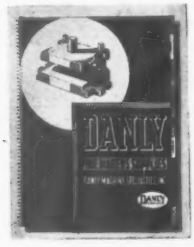

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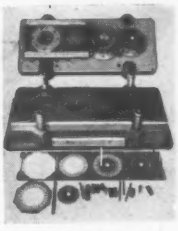

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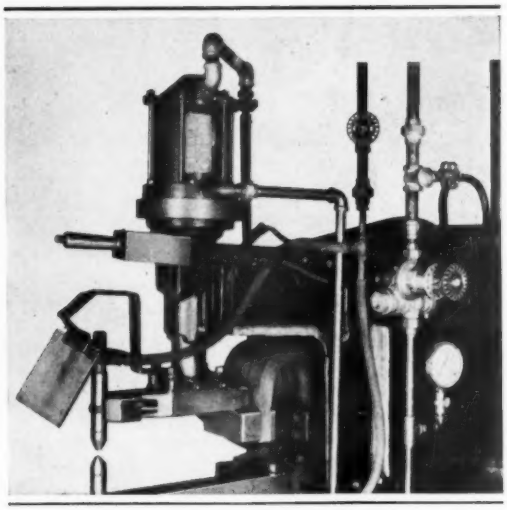

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Official Publication of the AMERICAN SOCIETY OF TOOL ENGINEERS

Vol. IV. DECEMBER, 1935 No. 8

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Owing to the nature of the American Society of Tool Engineers organization, it cannot, nor can the publishers be responsible for statements appearing in this publication either as papers presented at its meetings or the discussion of such papers printed herein.

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☆ Effective with the, next, January, 1936 Issue, the circulation of *The Tool Engineer*, is increased to more than

5,000 Copies Per Issue

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OF PLATEN PRESS?

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4. Plastic moulding—both hot and cold moulding—particularly where intermediate operations are required between successive moulding operations.
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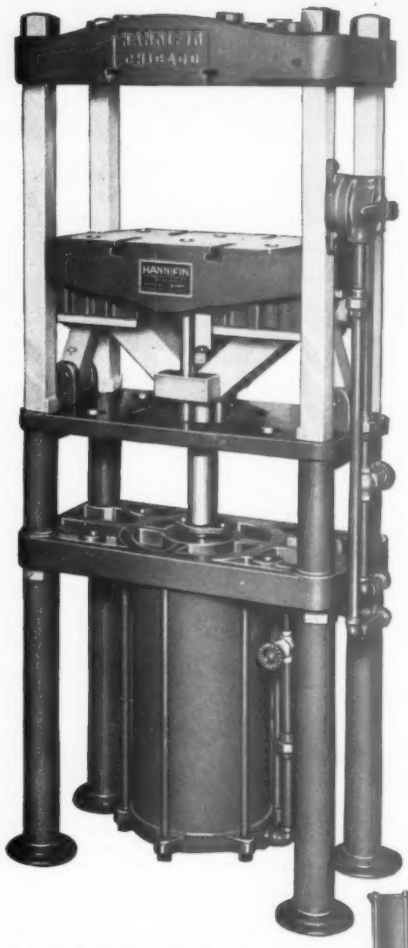

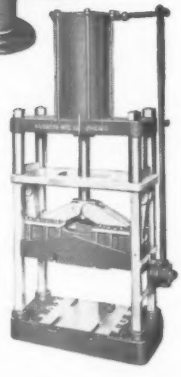

15-ton Air Operated Platen Press. Platen 17x14 in.; Between Columns, 22 in.; Daylight, platen down, 17½ in.; Daylight, platen up, 10½ in., (can also be built with greater or less vertical daylight space). Advance Stroke, 5½ in. at 6,000 lbs.; Power Stroke, 1½ in. at 30,000 lbs.; Advance speed six times the pressing speed. Cushioned reversal at full power. Capacity—15 tons at line pressure of 80 lbs./sq. in.—18 tons at 100 lbs./sq. in. A similar press inverted for bench mounting is available.

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DECEMBER MEETING

DETROIT

December 12th, 1935

HOTEL FORT SHELBY

Dinner: 6:30 p. m.
Technical Meeting: 8:30 p. m.

Real talent in entertainment is assured dinner guests

☆ ***Speaker:*** **E. H. Johnson, Supt. of Standards, Packard Motor Car Co.**
Subject: **Relationship of Processing to Cost.** ☆

This is the type of *practical* talk and discussion that every member will relish and thoroughly enjoy. Many members have expressed a desire for this type of speaker and subject. Mr. Johnson has been an industrial engineer in the consulting field, and is recognized as one of the most outstanding Methods Engineers in industry. He has been connected with such companies as Studebaker and Pontiac and at present is connected with Packard where he is Superintendent of Standards.

This meeting will come closer to "home" for Tool Engineers than any meeting we have had for some time. Mr. Johnson will discuss the selection, installation and operation of tools and machinery in mass manufacture.

This meeting will "ring the bell," and a very large attendance is anticipated.

NEXT MONTH'S MEETING

January 9th, 1936

Plans are being consummated for a dinner meeting of special significance. The speaker of the occasion will be

W. S. Knudsen

Executive Vice President of General Motors Corporation

☆ **Owing to the exceptionally large attendance anticipated for this meeting, members are urged to make reservations early to be sure of dinner places.** ☆

PRODUCTION PERSPECTIVES

. . . .

We just couldn't shed a very definite note of optimism in this column—even if we wanted to. So many encouraging things are happening all along the line that the improvement in the Tool Engineer's world, we spoke of last month, is now more apparent than ever.

The automotive industry, leader in recovery moves, now deep in production of 1936 models looks forward to 1937 with '37 "Pilot Models" already being built—to be ready very soon for the critical eyes of management. **Dodge** is **way behind** on orders as are other makers. **Hudson's production,** we understand is **700 per day.** A trend seems to be toward overdrives. **Warner Gear,** Muncie Division of Borg & Beck, recently was **awarded a large contract** for machines and equipment for the production of gears to be used in overdrive units. Lansing is again busy with **Olds plants going strong. Muskegon** is very **busy** with **Continental Motors** going nearly full tilt on the production of motors for **Oliver Farm Equipment** and others. All tool shops in the town are very busy. **Jackson,** Michigan is coming back very strong with a **gear plant** there very **active. Carboloy** reports an **increase** of **45%** in net sales for the first nine months of this year as compared to the same period of last year.

Reports from the **General Electric Co., Cleveland,** indicate that the company's factories engaged in the manufacture of electric range equipment are **running on a full-time schedule.** This is the **first year in the history** of electric range manufacture that a constant production schedule has been maintained from the beginning of the year, according to J. R. Poteat, manager of the company's electric range division.

Many companies in **Cleveland** are **expanding** their plants due to increased business and **favorable future** prospects. Among those who have either laid plans or let contracts for the work, are the **Independent Register Co.,** the **Marquette Metal Products Co., Cleveland Hardware Co., Triplex Screw Co., and Hickox Electric Instrument Co.**

Production in **Worcester,** Massachusetts **machine tool plants** is **very good,** according to reports from executives there. **Reed-Prentice** reports production "very good" and similar reports are heard from the **Norton** and **The Heald Machine Company. Silas T. Masey,** Vice President and Sales Manager of Heald has just returned from a business trip throughout the west. **Quality Tool and Manufacturing Company,** Inc., is a **new company** recently incorporated in **Providence. H. A. Nelson** is an incorporator. **Norton and Brown & Sharpe** recently exhibited their products before sessions of the New England Council-meeting in Boston. The organization sought to show activities of New England manufacturers. **Frank A. Daly,** Treasurer of **Potter & Johnston** since 1928, passed on, November 3 in Memorial Hospital at Pawtucket. He was 64 years of age and had been in failing health for some time. Surviving are a widow, a daughter and two stepsons.

From **Columbus, Indiana,** we hear that the C. B. & Q. R. R. has **placed an order for a Diesel-powered locomotive** with the **Cummins Engine Company.** The locomotive, a ninety ton unit, will be powered with two 500 H.P. V-12 Cummins Diesel engines. Special features are to be built in to provide for greater visibility and ease of operation. Four months will be required for completion. The **Lynch Corporation of Anderson,** Indiana, recently received an order for a large glass blowing machine from **China,** which is said to be the **first automatic glass blower in that country.** At South Bend, **Studebaker** reports December **production** will total **8800** cars about ⅓ increase over December, 1934. 7100 passenger cars and 500 trucks will be built at South Bend, 1000 cars will be produced at Los Angeles and 200 cars will be built at Walkerville, Ontario.

From **Los Angeles** comes news that a plant there has been converted into a **final assembly plant for Studebaker** to serve the west coast. The purpose is to make a saving in freight rates. The plant is a one story structure with an **area of 100,000 square feet** and is **now operating at top speed. Employment** has been provided **for 100 to 150 men.** The new plant does not affect employment or operations of the South Bend plant.

Ground has already been **broken for a new plant,** adjacent to the old plant, **for Michigan Tool Company.** The new building will add 20,000 square feet to present facilities. The expansion was made necessary by increasing volume on gear finishing, lapping and checking equipment, for small tools and "Cone" area contact worm gears. Many A.S.T.Eers of the Detroit area have made the trek to northern parts of the State in quest of deer. Some of these are **Robert Lindgren, R. M. Lippard,** and **R. W. Frye. One prominent A.S.T.Eer,** we hear has now mastered the art of determining deer tracks and can now readily differentiate them from *sheep* tracks. **H. D. Hiatt,** Racine A.S.T.E. Chapter Chairman reports his newly formed Chapter getting nicely under way. This Chapter will have its **regular meeting** Tuesday night, **December 3rd.** As we go to press, we hear that the second meeting of the proposed **Cleveland A.S.T.E Chapter** will be held at the Hollenden Hotel in the Cypress Room on the same evening. Very little doubt is expressed as to the chartering of this chapter at this meeting. A.S.T.E. officials from Detroit headquarters are planning to be present for formal installation ceremonies. Among those who have assisted **Mr. Rudolph A. Fintz** in the organization of this chapter are Messrs. **Jeffs, Kotersall, Shaw, Zerkle, Goddard, Rossbach** and **Fawcett,** all well known in Cleveland's industrial activities.

HISTORY and APPLICATION of ELECTRIC HEAT

•By CHAS. S. KINNISON

Hoskins Manufacturing Company, Detroit

As given before Detroit Meeting of the American Society of Tool Engineers, November 14, 1935.

NEWSPAPERS of today are printed from type that is cast from metal kept molten by electric heat. The wrist pins in your automobile, very likely were hardened with electric heat. The stitching in your shoes is impregnated with a wax kept at the right consistency with an electric heating unit. The glass in your spectacle lenses is usually annealed electrically. And of course, your shirt was smoothed out with an electric iron. Thus you see there are many ways in which our daily lives are touched by electric heat.

Now, as I relate the story that tells how electric heat became practically available for us, I do not want you to think that I stand here with the idea, in some sly way, of shooting propaganda at you. It is not my intent to boost the products of the company with which I am associated but rather I hope to tell you something that may prove interesting and a bit educational.

The Hoskins Mfg. Co. came into existence about 30 years ago on the basis of a patent granted to A. L. Marsh who is now our President and General Manager. This patent was built around his discovery of the nickel-chromium resistor alloys, called Chromel, and their application, essentially, as electric heating elements.

The pioneering work was carried on by Mr. Marsh in 1906, when for about 150 years the scientific world had known that a heat effect was produced by passing electricity through wire. Perhaps I should here point out that wires which are used for electrical purposes are chiefly of two types, namely, conductors and resistors. Now all known metal and alloy wires resist the passage of an electric current to some extent. Those that permit the current to pass through most readily are classified as conductors, of which copper wire is the most familiar. Only one other known metal, silver, is a better conductor.

On the other hand, those wires through which the current passes with most difficulty are called resistors. As a result of their resistance, part of the electrical energy is converted into heat, of sufficient amount to be of practical use. But prior to 1906, when any known metallic resistor (except platinum) was heated to incandescence, the wire burned out too quickly to permit any very significant use of electric heat.

And now before I tell you more about Marsh's discovery that provided the long needed and much wanted heating element, perhaps you'd be interested in hearing about what was probably the first electrical cigar lighter . . . . Mr. Frances Jehl, who was Thos. A. Edison's assistant at the old Menlo Park Laboratory, told me this incident. It happened one noon hour, during which the tireless Edison continued to carry on his work, while his assistants, of more common clay, ate their lunch and enjoyed the relaxation of smoking. On this occasion, Edison tossed over to one of the men a little coil of platinum wire, suggesting that if it were plugged into a circuit, it would generate enough heat to light their smokes. And sure enough, it did.

And now to get back to this first nickel-chromium heating-element, Chromel. The composition that proved to be most resistant to oxidation, was one of 80% nickel and 20% chromium. It might be well at this point to discuss in a simple way the matter of oxidation of metals in general. Let's consider an ordinary nail. It's nice and shiny when the hardware man hands it to us, but if we expose it to the usual atmosphere for a few days, it takes on a brownish film of oxide (rust), part of which we can rather easily rub off with our fingers. As time passes, more and more rust forms till finally the nail is destroyed through progressive oxidation. These facts are due first to the fact that iron itself rather easily combines with oxygen of the air; secondly, the resultant oxide is scaley in character and easily flakes off, thus exposing a fresh metal surface to continued attack of the ever active oxygen. This essentially explains also why the iron grate in your coal-fired furnace burns out.

In contrast to this behavior of iron, the nickel-chromium alloys have a vigorous tendency NOT to combine with oxygen. Furthermore, the oxide which does form is not scaley, but forms on the wire as a thin, tight skin which clings tenaciously to the metal. It is also very dense. Thus, you see, the alloy forms its own protective coating against oxidation—a coating that protects the wire somewhat as paint protects the iron smoke stack. As a result of this property of the alloys, at the time they were discovered by Marsh, they proved to have more than 300 times the durability of any other then known heating-element alloy. In terms of today, the durability is more than 600 times as great.

In regard to the the basic metals, nickel and chromium, it has always been of interest to me that the commercial deposits of the two are so widely separated on the earth's surface. For example, we go either down to Rhodesia in South Africa, or to the Island of New Caledonia off the coast of Australia, for the ore of chromium. And for the nickel ore, we go up into Northern Canado, in the Sudbury District. Finally these two widely separated metals are brought together in Detroit, and in high-frequency induction furnaces are alloyed together to make Chromel, which is known as "The Wire That

Made Electric Heat Possible."

Incidentally, before we discuss another property of these alloys, it might be well to point out that usually an electric heating element has longer life if operated continuously, than if the operation is intermittent. Used intermittently, as the wire alternately heats and cools, it also alternately expands and contracts which tends to make the protective oxide fall off the wire and thus shorten its life.

What I've said thus far represents our contribution to electric heat—and by the way, the domestic heating load alone now yields to the public utilities of the country an annual revenue of $132,000,000, according to the Department of Commerce.

The work of Mr. Marsh on nickel and chromium also resulted in a contribution to the pyrometer industry. Now as you men know, just as the heating-element is the heart of the heating device, we might also say that the business end of a pyrometer circuit is the thermo-couple.

Again telling you what most of you already know: if heat is applied to the junction of two wires made of different compositions, a tiny electric current is generated; so small, that it is measured in terms of milli-volts. The hotter you heat this junction, the more current is generated. Hence, if we measure that current, we have an indirect measure of the temperature.

Now, obviously, a thermo-couple to be good must not only withstand the ordinary industrial temperatures, but at a given temperature it should as far as possible always generate the same milli-voltage. That is, at 1600° F. say, the couple should always generate that amount of energy which causes the indicating needle to come to rest at the 1600° point on the meter scale.

One of the wires of this particular couple is an alloy of nickel and chromium and iron, which is also called Chromel; the other wire is made of nickel and aluminum and is known as Alumel. The thermo-couple itself is therefore known as Chromel-Alumel. It was patented, I believe, at about the same time that the resistor patent was granted to Mr. Marsh. This thermo-couple proved to have the necessary good properties, and is now very generally used—in your own plant very likely.

And that, gentlemen, is essentially the story of Chromel, the heating element and thermo-couple alloy.

Question and Answer Session

Question: How do you weld Chromel wire?

Answer: (by Mr. Alexander) It is very readily welded, if the correct procedure is followed. That is, by the use of a reducing oxy-acetylene flame. If an oxidizing flame is used, oxides are formed which have a higher melting point than the alloy itself, which causes difficulty. For a flux, we use a mixture of 6 parts of fluorspar to 1 of borax.

Question: What is the difference between Nichrome and Chromel?

Answer: (by Mr. Kinnison) While the Marsh Patent was operative, we granted a license to the Driver-Harris Co., to make the nickel-chromium alloys, to which they gave the trade-name of Nichrome. As far as composition goes, their alloy and ours are essentially the same.

Mr. Kinnison, as an aside, mentioned that every once in a while, somebody claimed to be able to heat a living room with a small electric heating unit. In this connection he pointed out that just as a pound contains just 16 oz., so also does a kilowatt of electrical power represent always just 3412 B.T.U.'s, and that was all the heat that could be gotten out of it; and that it took just as many B.T.U.'s to do a certain job of heating, by electricity as with fuel.

Question: Does the consumer have any place to go for information that is unbiased regarding the value received in articles built by different manufacturers?

Answer: (by Mr. Kinnison). There is an organization in New York, called the Consumers Research Bureau, that does publish such records, but, personally, I question how any laboratory has the facilities or engineering brains to cover every mechanical gadget to determine its worth . . . . I was going to ask the Professor how the consumer can be heard?

Professor McFarland: Just the same as your organization. They must be organized. There is a movement in Washington at this time to organize a Consumer Representative organization. How far they will go depends on how much support they get. At present, the United States Bureau of Standards has a list of commodities and their worth, but this is only available to the manufacturers and government agencies that buy products for their own use. It is not available to the consumer at large, neither does it seem advisable to make that available to them.

Question: Are there any wires used for heating besides the nickel-chromium alloys.

Answer: A few years ago, in Sweden, there was developed a resistance wire that contains no nickel. It is iron, chromium and aluminum, and is called Kanthal.

Editor's Note: At this same meeting an excellent address was given by E. W. McFarland, Professor of Economics, at Wayne University in Detroit. His subject was "The Consumer Must Be Heard." Professor McFarland showed the growing importance of the consumer as a factor to be reckoned with in the changing world. He contrasted the consumer with the employee and showed that they were not, as is commonly supposed, one and the same--particularly from the standpoint of economics. He stressed the importance of well defined and readily recognized *standards* by which various commodities purchased by the consumer should be judged. He spoke of a way out of depression, mentioned the tremendous markets still existing, and emphasized that there is no "over-production." We regret that the entire address is not reprinted, but a lack of space has precluded this in favor of the technical discussions.

Let Us Work Together

AN EDITORIAL

BREATHES there a Tool Engineer with soul so dead, who ne'er unto himself hath said, "This is the Machine Age, the product of my own creation—and, where am I heading?"

Carried to the ultimate, it is conceivable that the machine will eventually do all work and will provide practically every necessity and luxury that man can desire. If society is approaching, even remotely, such a condition, the Tool Engineer who is very largely responsible for it may wonder how he will fit into the ultimate picture.

We hasten to assure him that he will not soon join the ranks of the widely discussed "permanent class of unemployables" because of his profession. First, because we have an almost infinite era of progress ahead of us before we reach the state referred to above, and second, because even if we were already arrived no one is better qualified to maintain it than the Tool Engineer who is the originator of the system. Yet, while it is perfectly natural that the Tool Engineer should consider this the Machine Age—since all mechanized civilizations call it that—the facts refute it. For, consider that most of a thousand million people in far eastern and other undeveloped regions have never seen a spinning frame, loom nor modern agricultural implement, nor used a telephone nor listened to a radio, and we can almost effect a contemporary contrast between Machine and Stone Ages. With all our talk of overproduction during our best years our export business on mass manufactured products has been but a small percentage of the total produced.

In an address before the country's notables at the preview dinner of the recent Machine Tool Congress in Cleveland, Thomas R. Watson said: "When you consider that we have outside of the United States 94 percent of the population of the world to work on, and that we are producing here one half of the goods manufactured, that fact in itself proves that we must be making a lot of things here that people in other parts of the world need and will use . . . ."

So, you Tool Engineers, you have every reason for confidence in the potentialities of your profession. But, you also have need of concerted action in your own behalf. While you deserve the recognition that is rightfully yours you've got to be eternally on the job to achieve it. And, you can't do it alone, hence, the need of organization, nor, can you reach your goal even with organization, unless there be unity of purpose and a concerted movement toward progress. More, there must be training and education.

In all this, the American Society of Tool Engineers is admirably suited to your purpose. It has already won you recognition as a professional class; has given you a professional entity you could not possibly have won through your individual efforts. In a few short years it has raised you from a heterogenity of production superintendents, master mechanics, tool designers and what have you to the homogenity of a recognized profession. We do not say that it has made better *men* of you, as far as innate character or natural ability is concerned, but we sincerely believe that the A.S.T.E. has enhanced your possibilities—your future, a belief which is shared unanimously by our membership. The Society has not waged a direct fight for higher wages, nor for minimum hours, but through education and constructive talks on how to make *good tools better* has helped you to help yourself. The A.S.T.E. has not concerned itself with controversy, nor with the concoction of alphabet soup and other trifling issues. It has simply worked, consistently, determinedly and with progressive conservatism for its enrolled as well as for its prospective membership. So, while membership in the American Society of Tool Engineers may not make you a *better* man, it can make you a more *qualified* man—a better *engineer*. That is why the most progressive men in the tool engineering field are rallying to the Society's standards; why new chapters are being chartered in remote cities. This, then, is a direct message to *you*—a challenge! If qualified, and not already a member, make your application NOW! The best days of the Tool Engineer are just ahead. Through unity, we can accomplish great things.

This is not idle prophecy, nor whistling in the dark. Prospects for the New Year are distinctly promising. Merchants are optimistic, as the masses buy the products of mass manufacture; automobile makers report unfilled orders by the tens of thousands as a result of enthusiastic attendance at the automobile shows; radio, furniture and household appliance sales are climbing, while machinery and plant equipment demands are greater than at any time in the past five years. *We are going places*, and we are definitely on our way, with Tool Engineers blazing the trail to new and greater achievements. So, join *now*, we need you, and you need us. Let us work together.

The force—the mass of character, mind, heart, or soul—that a man can put into any work, is the most important factor in that work.—A. P. Peabody.

Milling Cutter Power Requirements

By O. W. WINTER
MEMBER A.S.T.E.
Manager Cutter Division Whitman & Barnes, Inc.

Editor's Note: This is the second installment of Mr. Winter's article on Milling Cutter Power Requirements. The first, of which, was published in the September issue of THE TOOL ENGINEER. This installment explains the use of the important charts Mr. Winter has worked out. The first of these charts appeared on page 47 of the September issue, another set appears on the opposite page and in an early issue another set will appear. Tool Engineers and Production Executives are urged to keep these charts on file for future reference, as they are of convenient size and form.

HOW TO USE THE CHARTS

A. *Unknown Factor—Power Required*

Known Factors—1. Material being milled
2. Type of cutter to be used
3. Feed in inches per minute
4. Width and Depth of cut
5. R.P.M. of cutter
6. Number of teeth in cutter
7. Products of #5 and #6
8. Efficiency of the milling machine.

Directions:

1. Select proper chart for material and type of cutter under consideration.
2. Deduct 10% to 20% from the power available at the machine to obtain power available at the cutter.
3. Locate the figure obtained in #2 on the horsepower (lower right horizontal) scale.
4. Sight vertically to where a perpendicular line from this point would intersect the inclined line representing the number of tooth contacts (products of rpm and number of teeth in cutter)
5. From this point sight to where a horizontal line would intersect the inclined line or curve representing the width and depth of cut.
6. From the latter intersection point sight vertically to the feed (lower left horizontal) scale and read the feed in inches per minute allowable.

NOTE: If a gang of cutters is to be used and the allowable feed rate is desired, proceed as follows:

1. **Two cutters.** Figure the feed rate allowable if the total power were available for cutter #1, call this feed A. Repeat for cutter #2 and call this feed B.

The exact formula for the feed rate is:

$$F \text{ equals } \frac{AB}{A+B}$$

EXAMPLE—Material Cast Iron.

Suppose 5 HP was available to the machine and that 20% was lost before reaching the cutter. In other words the machine was 80% efficient. There would be 4 HP delivered to the cutter.

Cutter #1 is a spiral slab mill having 10 teeth and running at 17 rpm and the cut is 3" wide x ⅛" deep. Chart #9 shows that 4 HP could feed this cutter along at 17½"/min.

Cutter #2 is a half side mill having 24 teeth and also running at 47 rpm. The cut is 1½" wide x ¼" deep. Chart #6 shows that 19" feed could be taken if this cutter were acting alone.

Therefore in this example A is 17½ and B is 19. Substituting in the formula we have:

$\frac{17.5 \times 19}{17.5+19}$ equals $\frac{332.5}{36.5}$ equals 9.36 inches per minute allowable feed

Proof of this formula follows:

HP equals Total power available.
x equals Power required by cutter #1
y equals Power required by cutter #2
F equals Allowable feed rate for both cutters
A equals Allowable feed rate for cutter #1 alone
B equals Allowable feed rate for cutter #2 alone
a equals Cutting condition constant for cutter #1
b equals Cutting condition constant for cutter #2

1. x equals Fa $a \text{ equals } \frac{x}{F}$
   y equals FB $b \text{ equals } \frac{y}{F}$
2. HP equals x+y equals F (a+b)
3. HP equals Aa $a \text{ equals } \frac{HP}{A}$ and $A \text{ equals } \frac{HP}{a}$
   HP equals Bb $b \text{ equals } \frac{HP}{B}$ and $B \text{ equals } \frac{HP}{b}$
4. Therefore A equals $\frac{x}{F}$ equals $\frac{HP}{A}$ and b equals $\frac{y}{F}$ equals $\frac{HP}{B}$
5. A-B equals $\frac{HP}{a} + \frac{HP}{b}$ equals $\frac{HP\,(a+b)}{ab}$
   equals $F^2 HP \frac{(x+y)}{F\ F}$
   equals $\frac{F\ HP\ (x+y)}{xy}$
   equals $\frac{FHP^2}{xy}$
   equals $\frac{xy\ (A+B)}{HP^2}$

As $\frac{x}{F}$ equals $\frac{HP}{A}$ Also $\frac{y}{F}$ equals $\frac{HP}{B}$

x equals $\frac{HP\ F}{A}$ y equals $\frac{HP\ F}{B}$

Therefore

$$F \text{ equals } \frac{\frac{HP^2F^2}{AB}\ (A+B)}{HP^2}$$

$$\text{equals } \frac{F^2\ (A+B)}{AB}$$

$$\frac{1}{F} \text{ equals } \frac{(A+B)}{AB}$$

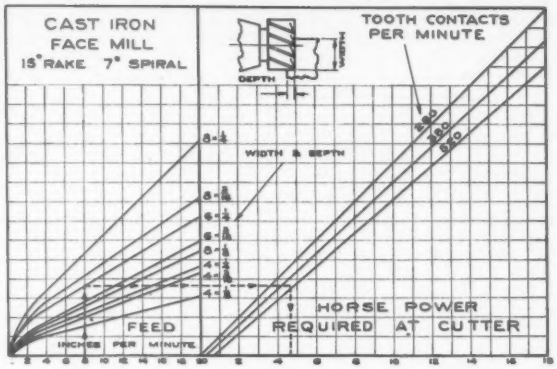
Proving $F \text{ equals } \frac{AB}{(A+B)}$

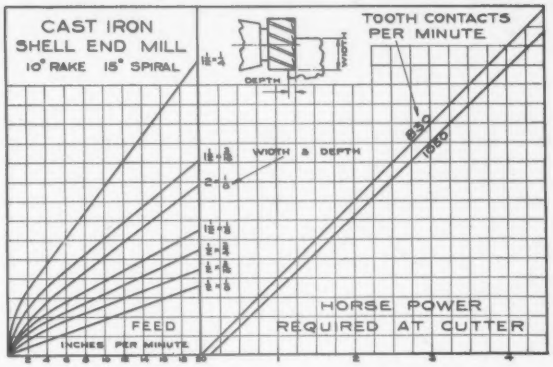
Use of this formula and charts for 3 or more cutters will appear in next issue.

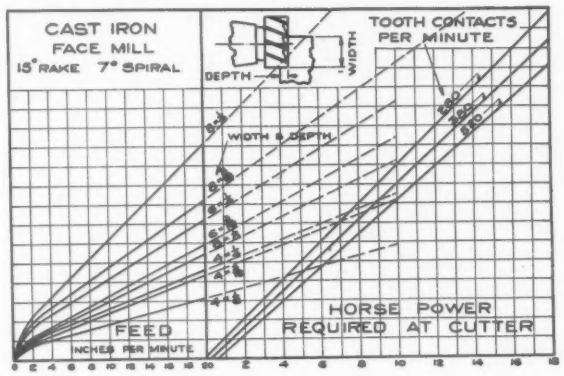
MILLING CUTTER POWER REQUIREMENTS

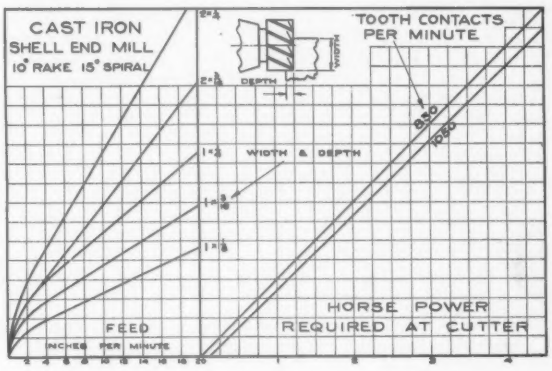
CAST IRON

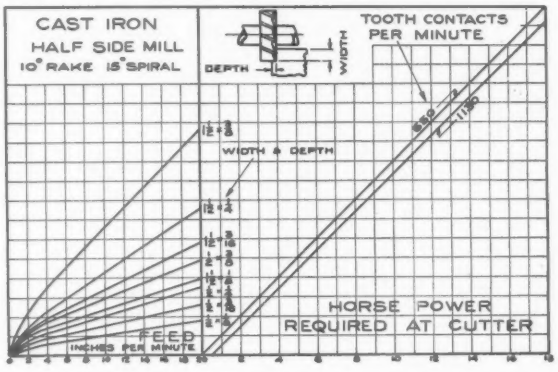
NICKEL CHROMIUM STEEL

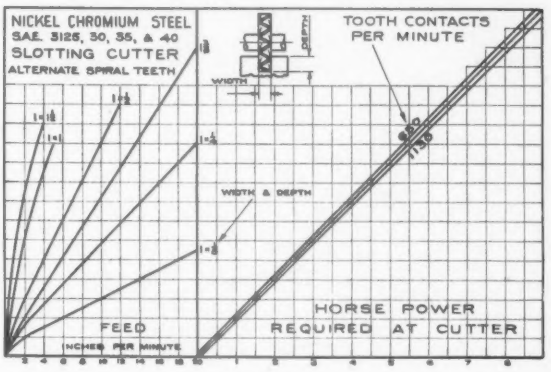


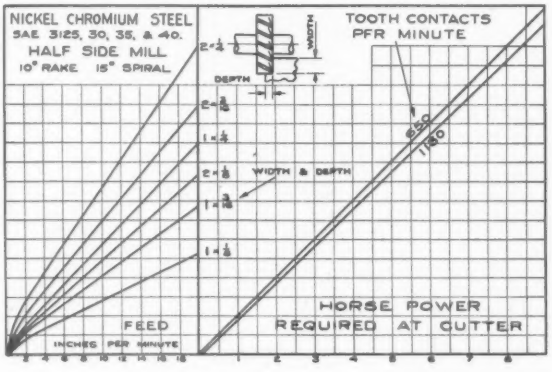


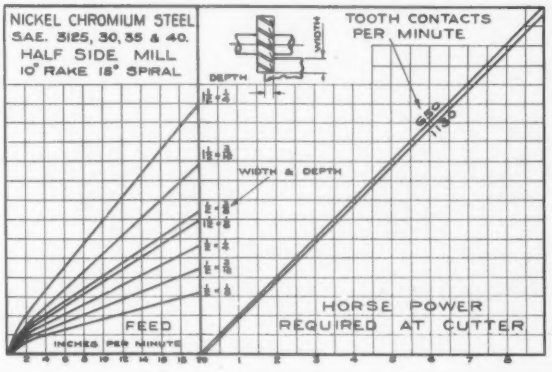












(Tear out this page and file for future reference)

THIS MONTH'S COVER

FROM ELI WHITNEY UP TO NOW, AND—

WHAT an economic force Eli Whitney started when he first used the "New Principle" of interchangeability by precision as a sales argument to obtain a Government contract for 15,000 muskets in those hectic days of 1812.

Today, that contract would not keep an arsenal nor a machine shop busy for more than a few hours. But, what a development of commercial wealth that basic principle has made possible.

How many of us would own an automobile today if it were manufactured piece by piece without precision or interchangeability as things were made before this idea developed?

How many shirts would you have in your bureau drawer if he had not produced the cotton gin, nor Elias Howe the sewing Machine?

Not many, we all admit, and yet how many of these and hundreds of other necessary things would we have had even, if later men had not developed and devised better and more reliable means of controlling the duplication of parts so that we could not only have so many of these things but buy them with safety and assurance.

Splitting the inch to finer and finer divisions has not only made it possible for many men to produce many pieces of the same kind accurately and inexpensively, but it has made possible the finer measurement of things which have led to new possibilities in invention.

Where Eli Whitney's object was to make 15,000 flintlock triggers which would fit 15,000 flintlock hammers, made by possibly a different group of workmen, and with probably nothing better than dividers and calipers screwed down hard and used as gauges to check the sizes, today we find it practical and profitable to make hundreds of thousands of connecting rods which will fit a like number of piston wrist pins both capable of operating together in a motor turning over up to 3000 revolutions per minute, or more, and for days and months and years under high heat and extreme cold.

Federal Model 110 *Clear Vision "Comparator." One ten thousandth of an inch measures over* 1/5″ *on the dial.*

Mechanical precision combined later with chemical precision has made this miracle possible. Things which once looked dreamlike and impractical have become immensely real and practical.

Clumsy, complicated devices have become simpler. Simple things have become automatic. The inch has been split to hundredths, thousandths, tenths of thousands, half of tenths of thousandths, and millionths. We are now operating practically—and economically so, in the tenths of thousandths. The laboratories are searching ahead in the millionths. The sensitive instruments that search ahead into these "hair splitting" spaces are simplified and made more practical, or less sensitive instruments are made more sensitive and at the same time retain their practicality, in order that the shop can follow the laboratory.

The instrument illustrated on the cover of this magazine is a practical illustration of this fact. The present practicality of holding the duplication of parts to tenths of thousandths is a proven economic fact today. Finer measurements are being sought for. It may seem unnecessary at the moment, but all those men from Whitney up to now did not think so.

This trend of the times is anticipated in this comparator made by Federal Products Corporation of Providence, R. I. It accurately measures .00005″ and even .000025″ can be readily determined; in fact, half of 1/10,000″ (.00005″) is seen as nearly ⅛th inch on the dial (actually .1175″). It is not essentially a laboratory instrument but is a practical shop bench instrument. It is extremely simple, rigid and embodies dial indicator mechanisms which have proved accurate and reliable in practice.

The indicator itself is extremely accurate and is designed and constructed along the basic principles which the Federal people have found to be accurate and dependable over a long period of time. It is brought into approximate position by the hand screw as shown and positively held by another on the opposite side.

The anvil is mounted on a finely threaded ring which gives it a final micrometer adjustment. The face of the anvil itself is carefully lapped and tested to the requirement of 75% of the surface being accurate to one wave length of light through an optical flat.

It is an instrument which enables everyday shop practice to make one more step forward in that march into the future. And that march is not being tramped alone by the automotive and mechanical industries. More and more, other industries are falling in line for they are learning that production control can be better assured by the use of mechanical indicators than by variable human senses.

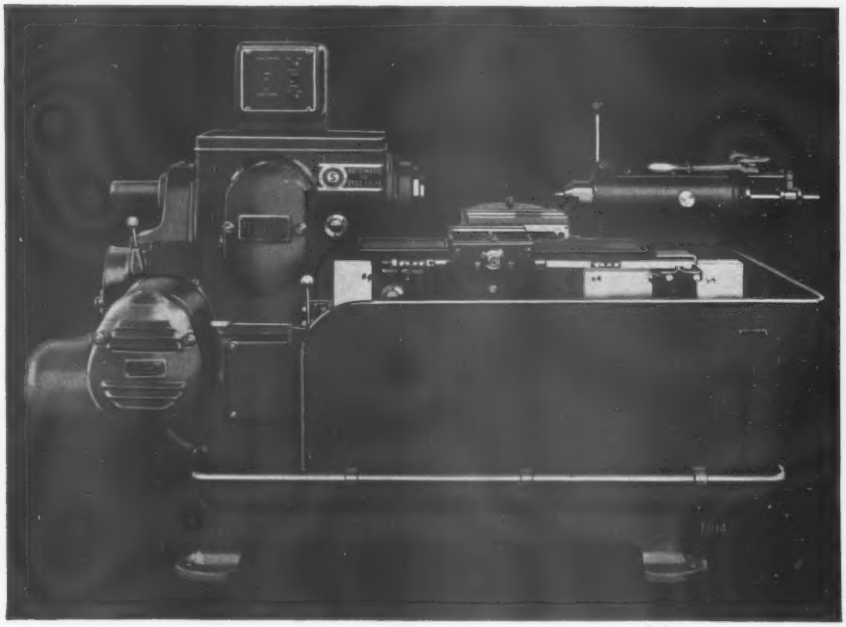
Dial indicators are used to test the deflection of cumbersome, stolid concrete; the stresses and strains of the Golden Gate Bridge in California, the longest span yet built by man, are being measured and checked by means of these accurate instruments in order that people may cross in perfect safety; the reflex action caused by the nerves in the leg of a frog; the hardness of rubber, metal, cork; the vibration of machinery and buildings; the uniformity of the windings of silk, rayon and cotton strands on textile cones in order that milady may have more sheer and beautiful hosiery, negligees and dresses. The roughness of finished metal, the surface and thickness of paper, the thickness of the skins of peas, the growth of oranges and grapes, the thickness of moving picture film, of building material, floor coverings, soap flakes, are only a few of the many things that men measure accurately today, not only in their search into the future but as a daily routine.

New possibilities are discovered, more printable papers, tastier peas, clearer moving pictures, quicker dissolving soap are the result. Better production, more responsibility is placed where it should be, parts go together more rapidly and fit better, things wear less rapidly, noise is cut down and eliminated, customers find products are more closely duplicated and more as they specified them to be in their orders.

All these and more are made possible by the economic force which began to develop back in the days when Whitney and others like him sensed the value of the "New Principle" of precise duplication.

Excellent On Short Runs

- ★ NEW QUICK SET-UP
- ★ NEW SPEED OF OPERATION
- ★ RAPID TRAVERSES OF 250″ PER MINUTE
- ★ NEW TYPE HARDENED STEEL WAYS
- ★ AUTOMATIC LUBRICATION
- ★ SIMPLIFIED ELECTRICAL CONTROL



The Automatic 10″ Stub Lathe

The most notable quality of the Sundstrand Automatic 10″ Stub Lathe is its excellence on short-run work. We say "most notable" because certain Sundstrand machine tools are known the world over for their high productive capacity and economy on long-run work. When our Automatic 10″ Stub Lathe was announced, industrial executives naturally assumed that it is a high-production machine—and that is correct. The Automatic 10″ Stub Lathe has the accuracy, power, strength, rigidity, and durability necessary for highly successful performance on long-run work.

It is also true that the Automatic 10″ Stub Lathe is equally efficient and economical on short-run work, for the following principal reasons. Cutting tools used on this machine can be set, or changed, easily and quickly. The whole automatic cycle, including feeds and spindle speeds, can be established readily merely by changing pick-off gears and setting trip-dogs. There are no special cams or other parts to make. Changing from one job to another does not require a highly trained mechanic—and it takes only a few minutes. By recording data established on the first run, repeat operations can be set up even more quickly.

Made in four models and four lengths, Sundstrand Automatic 10″ Stub Lathes are excellent on short-run work as well as mass production. Investigate! Ask for new circular that describes these machines in detail.

STERLING-FRENCH MACHINERY CO.

NEW CENTER BUILDING ◆ DETROIT, MICHIGAN ◆ PHONE MADISON 3660

Exclusive Sales Representatives for Sundstrand Products in the Detroit Territory

MacArthur Joins Eclipse

The Eclipse Counterbore Company announces an increase in its personnel in the appointment of Mr. J. E. MacArthur as Assistant General Manager, in charge of national sales and service, on December 1st, 1935.

Mr. MacArthur brings with him many years of experience, starting with apprenticeship at Brown & Sharpe Mfg. Company, and including executive positions with such well-known concerns as Pierce Arrow Motor Corporation, General Motors of Canada, Ltd., and recently Kearney & Trecker Milling Machine Corporation, Milwaukee, Wisconsin.

The sales and service policies of the company will thereby be extended for the benefit of the many users of Eclipse products.

Local and Michigan sales are in charge of A. Subia, whose connection with the Eclipse Company has been of several years duration.

DETROIT CELEBRATES FALL FESTIVAL

Detroit A.S.T.Eers celebrated their annual Fall Festival or Feather Party at the Hotel Shelby, November 22. All those who attended the party reported a very enjoyable time. The evening was spent in dancing to the music of the radio famed Leonard Seel and his orchestra. Detroit's favorite Singing Duet, Tommy Evans and Sally Johnson, also added to the festivities and pleasures of the evening.

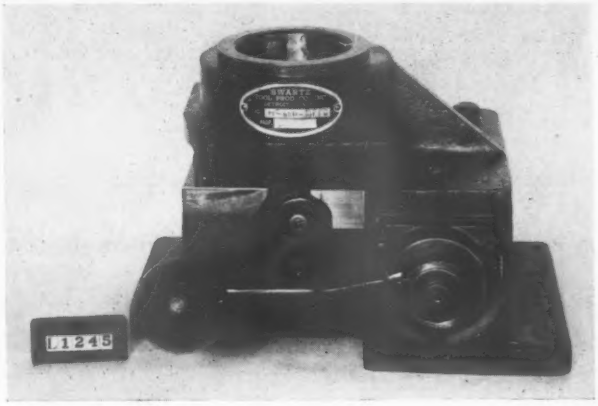
The high light of the evening was a raffle of a dozen, or more turkeys, which were won by the following superstitious folk, who believe in carrying a rabbit's foot to such events: Mrs. J. C. Glenzer, Mrs. E. C. Herman, Mrs. G. A. Centmayer, Mrs. J. W. Hansen, Mr. and Mrs. A. M. Sargent, Mr. and Mrs. Oscar Fair, Mr. and Mrs. Ford Lamb, Tom MacConochie, Paul Diamond and Albert Tunell. Strange as it may seem, the "Gentlemens' Special" prizes were won by Mrs. Anderson, Mrs. Sargent and Mrs. Fair—each of whom received several offers from gentlemen present to exchange their prize for a turkey.

Isn't it the picture of efficiency? Sturdy. Well proportioned. A generous assortment of work speeds. Combination live or dead spindle. Swivels as much as 90 degrees.

You should see this Landis 14" Type C. Hydraulic Universal headstock in action. No vibration. No noise. Just smooth, quiet delivery of power — an essential contribution to chatter-free grinding.

Certainly these are most excellent reasons for the assertion—a headstock that's ahead. A description of the entire machine should be in your file. Ask for a copy of catalog No. L-33. 175

LANDIS TOOL CO.
WAYNESBORO, PA.



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Engineered and Built

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Part—(Wheel) hydraulic cylinder.

Operation—Hollow-mill.

Features—Part is located over plug and clamped by means of a wedge operated by a pinion driven with a standard Swartz jig lock. A weighted lock handle is used to insure tight clamping with least possible effort of operator. This is an easily operated yet extremely rigid jig which insures a smooth milled surface.

SWARTZ TOOL PRODUCTS CO., INC.

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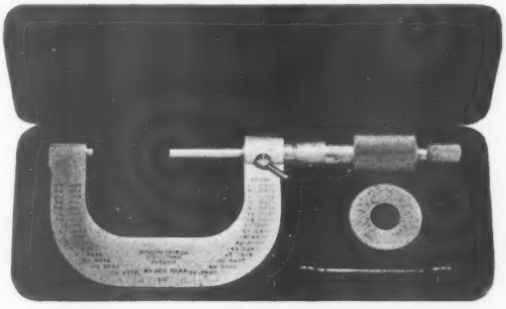
THE "MIKE" YOU CAN DEPEND ON



A REAL PRECISION MICROMETER

Incorporating the following features

Hardened, ground and lapped lead screw
Definite guarantee of lead screw accuracy
Positive and convenient spindle lock
Dull finish on graduations for easy reading

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SWEDISH GAGE COMPANY OF AMERICA

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ALSO EXCLUSIVE DISTRIBUTORS FOR

R & M MANUFACTURING CO.

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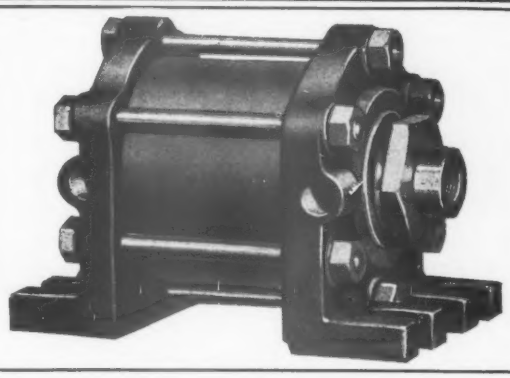

"HOPKINS" NON-ROTATING DOUBLE ACTING

STYLE 1 AIR CYLINDERS

● Made also in 6 other standard styles, cushioned or non-cushioned, and in all desired capacities.

THE TOMKINS-JOHNSON CO.

624 N. Mechanic St., Jackson, Michigan

Detroit Representative HABERKORN & WOOD

A.S.T.E. Chapter News

Most A.S.T.E. members have heard of the newly formed chapter at Racine, Wisconsin. This fine group of enthusiastic and interested manufacturing executives has already made an excellent start toward a strong, effective local chapter in a town not nearly as large as many other centers where the potential membership would number several times as many. The splendid work of the Racine members is indicative of what can be done in other cities, and as we approach the new year, it is expected that many more chapters will be added to the roster.

Cleveland, undoubtedly will have a chapter chartered on December third, at the second meeting of this group. Hartford, Connecticut is getting ready for a chapter, we're waiting to hear from our good friend and member Mr. d'Arcambal, who has kindly volunteered to sponsor the Hartford chapter.

In Worcester, with so many plants there—such as Norton, Heald, Reed-Prentice, Leland-Gifford, Persons-Arter and others—there is an excellent opportunity for a local chapter of A.S.T.E. Rockford, Illinois is another point where A.S.T.E. should be represented, with such companies as Ingersoll Milling Machine Company, Barnes Drilling Machine Company, Greenlee Brothers, W. F. & John Barnes, Rockford Machine Tool Company, Sundstrand and many others. Bridgeport is another center to which we are looking for a chapter soon.

In Buffalo, A.S.T.E. member, J. Don Reep has volunteered to sponsor a chapter. Tool Engineers of the Buffalo area should get in touch with Mr. Reep at 76 Pearl Street, Buffalo. The first meeting of this proposed Buffalo Chapter will be held soon—we're waiting to hear from Mr. Reep, the date, hour and meeting place.

Anyone interested in promoting a chapter in his area should get in touch with American Society of Tool Engineer's headquarters 31 Melbourne, Detroit, Michigan or *The Tool Engineer*, 2842 W. Grand Boulevard, Detroit, Michigan. All the routine work will be handled by Society Headquarters such as mailings, etc. Full details will be supplied on request.

Ingersoll Cutter Catalog No. 51

This new catalog issued by The Ingersoll Milling Machine Company, Rockford, Illinois features the new Ingersoll Zee Lock Cutter Blade, showing details of its design and application to milling cutters—face mills for various duties, shells end mills, solid shank end mills, half side, staggered tooth, interlocking, and plain milling cutters, also the Ingersoll Cone Type of face milling cutters and Ingersoll Helical End Mills and Helical Milling Cutters. Ingersoll Multi-Blade Cutter Tools are described with tool charts showing applications of tools of this type. A brief description is given of Ingersoll Jigs and Fixtures and a brief description of the Ingersoll Cutter Grinder, is also given.

FAUVER

"Oil Resist and Pressure Proof"

Rubber Hose Assemblies

They flex

They twist

They LAST

All their long lives they serve moving parts with lubricants, coolants, cutting oils, plastics. They transmit hydraulic power—pressures from 0 to 15,000 lbs.

Ask for descriptive circular.

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Specialists in Lubrication, Filtration and Hydraulics

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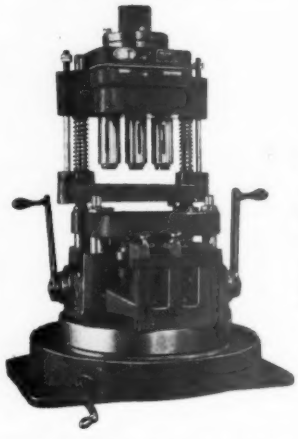
HIGH PRODUCTION

AT LOW COST WITH

BUHR MULTIHEAD EQUIPMENT



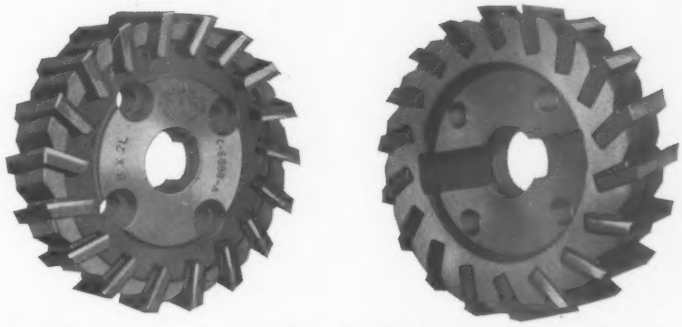
Complete tooling of machines: including Units Jigs, Fixtures, Index Tables, Adjustable Micro Lock Holders, Drill and Tap Collets, Speeders.

BUHR MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

DETROIT PHONE - - CHERRY 3113

OUR DESIGN IS THE RESULT OF YOUR EXPERIENCE WITH MILLING CUTTERS



The most economical ratio of adjustment of side and peripheral cutting edges is established by the job itself.

That is why the adjustment of GD & GD inserted serrated blade milling cutters is not limited by mechanical construction.

GODDARD & GODDARD CO.

DETROIT, MICH.

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Hydraulic Chucking Devices

SELF CONTAINED

SAVE

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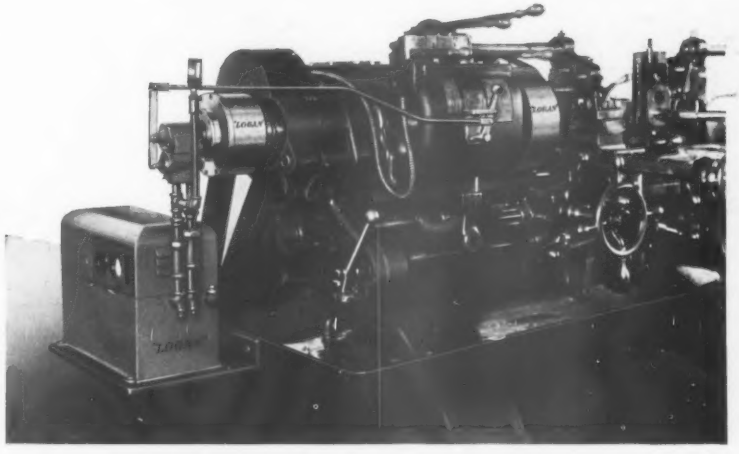

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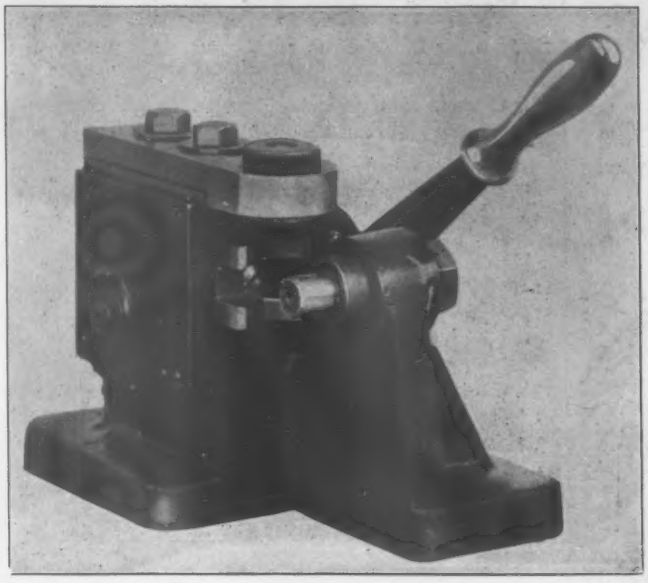

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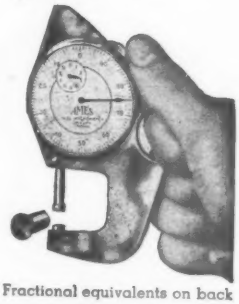

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